

Energy Matching Funds  
School of Energy Resources Proposal

**Integration of Produced Water Thermal Desalination and Steam Methane Reforming for Efficient Hydrogen Production.**

**EMF Request: \$2,750,000**  
**Total Project: \$9,996,153**  
**Duration: 2 Years**

Water is a precious resource in Wyoming. Oil and Gas wells produce large quantities of water, but this water is too salty to use. Our project will treat oil and gas produced water and simultaneously put it to beneficial use generating hydrogen ( $H_2$ ). This project will produce 1 ton  $H_2$ /day using produced water at a cost  $\sim 15\%$  below existing methods.

Steam Methane Reforming (SMR) is an established technology for hydrogen ( $H_2$ ) generation and can be combined with carbon capture and sequestration to make low-carbon “blue” hydrogen. SMR requires methane and clean water. Many natural-gas-processing facilities are located near hydrocarbon well fields which produce methane and a saline brine (Produced Water). If contaminants (salt, wax, etc.) can be removed from the brine, then these two reagents can be combined to produce low-carbon hydrogen.

In this project we will design, build, demonstrate, and field-test a supercritical water desalination and oxidation (SCWDO) unit integrated with an SMR unit. Both the SCWDO and the SMR processes require hot water, so we aim to realize efficiency gains by keeping the water hot throughout the system and using heat exchangers to minimize new energy input into the system. The coupling of these two technologies is expected to yield a whole greater than the sum of its parts.

Wyoming Focused: Our project has potential to benefit the whole country, but initially benefits Wyoming. This is shown in the locations where work is performed. The SCWDO-SMR will be designed at Los Alamos National Labs (Santa Fe, NM) and UWyo (Laramie, WY), built at EP&C (Cheyenne, WY), and deployed at William’s Echo Springs gas plant (Wamsutter, WY). After completion of the award UWyo will own the containerized pilot and use it to facilitate other awards and to provide demonstrations and outreach to companies and communities interested in the hydrogen economy. All Energy Matching Fund funding will be spent within Wyoming and more than matched by federal and private contributions.

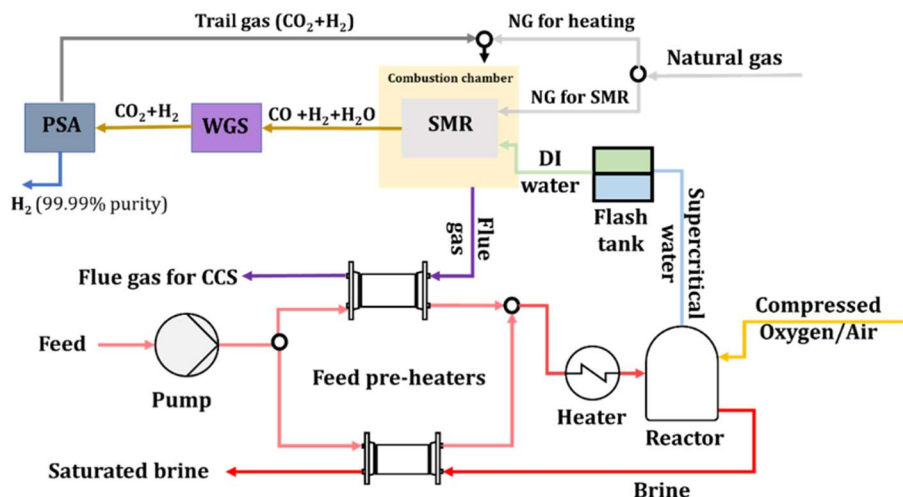


Figure 1. Process flow diagram integrated produced water treatment system via supercritical water desalination (SCWDO) with SMR process for  $H_2$  production. Pressure swing absorption and water gas shift units shown.